WARTHIN (A.S.)

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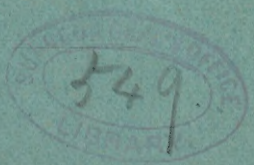

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SOME PHYSIOLOGIC EFFECTS OF MUSIC IN HYPNOTIZED SUBJECTS.

BY ALDRED S. WARTHIN, PH.D., M.D.,
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HAVING been led during the past year by an interest in musical esthetics to an investigation of the expressive power of music, especially with reference to the Wagnerian music-dramas, I came upon certain results extremely interesting in their nature, and certainly valuable as contributions to our knowledge of musical effect. These were the result of experiments made to ascertain the physiologic and mental effects of music in subjects that had been put into a state of hypnosis.

It has long been known that music is capable of inducing changes in certain functions of the body, as the circulation, respiration, etc. The marked effects that musical sounds have sometimes produced in animals are also familiar. From the legends of Apollo down to physiologic experiments of modern times, records have been made from time to time of such observations, but the field has, apparently, appeared so little promising that scientific experimentation of any importance has not been done in this line. The majority of the observations recorded have been of a popular nature, in like manner noted, and are, chiefly, of little value. Occasionally these


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are collected, new facts added from the author's experience, and an attempt made to draw some sort of a conclusion or to arrive at some law of musical effect. Among the more important of these are: "Effets et Influence de la Musique sur la Santé et sur la Maladie" (Chomet). "Sull' importanza fisiologica e terapeutica della Musica" (Vigna). Also occasional articles appear in the medical journals upon the effects of music in disease, especially in abnormal mental conditions. But prolonged and careful investigation seems never to have been made in this direction, and the results of the recorded observations are practically of little importance.

While attending performances of Wagner operas at Munich and Vienna an observation of musical people who were deeply affected by the Wagnerian music led me to the thought that these musical "Schwärmer" in their state of musical *en rapport* were in a condition of self-induced hypnosis, and further observation tended to confirm this idea. In giving themselves up to the emotional effect of the music, these people were putting forward their subjective natures at the expense of their objective relations to the world; for the time, being in a state exactly analogous to the hypnotic state, if not really the same. From this it was but a quick passage to the thought that the power of music, whatever that might be, would be displayed and felt in its greatest and purest force in conditions of complete mental subjectivity, when all external connections and relations have been removed—a state in which nothing but the music would exist for the mind—that is, a complete hypnotic state.

At the first opportunity for making such experiments, the effect of music upon persons who had been put into the hypnotic state was tried with results of a very interesting and remarkable nature. After a great deal of research I have not been able to find elsewhere anything of the nature of these experiments, or to find anywhere records of such decided effects of music upon the physiologic functions of the body. These effects were so constant and so marked in all of the cases experimented upon that I consider them worthy of report.

The number of cases experimented upon is only seven, the small number being due to the reluctance of the average normal individual to be made the subject of hypnotic experiments; but these seven represented a wide range of individual character within limits apparently normal. Of this number, five were men, two were women. All were healthy and passed for normal individuals, and as possessing more than an average mental ability. No nervous or abnormal condition existed in any subject, and only one could be called emotional. Four were physicians and teachers, the others students. No one of them had either been hypnotized before or had been especially interested in the subject. All but one consented to the experiments with reluctance, and entered into the hypnotic state only because of the scientific aim. No one of the subjects was a musician in any practical way, and with but one exception they did not possess any marked development of the musical sense. In the normal state music produced no great emotional effect and no apparent physiologic action. All but one were more or less

fond of musical sounds, and derived pleasure from the art.

As all experimental work in hypnotism is especially liable to error through deception, either voluntary or involuntary, on the part of the subjects, especial care was taken to avoid this, although the character of the subjects was such as to make this precaution seemingly unnecessary. The experiments were made at different times, and no occasion was given for the imitation of results obtained in one subject by any of the others. Moreover, as the chief effects were physiologic, there was no chance for any such deception.

The subjects were hypnotized by the common method of fixing the eyes, passing the hands over the head and face, and at the same time making word-suggestion. After several trials they could usually be brought into a deep hypnotic state. This was done in a room containing a piano, the subject being placed in a chair or upon a lounge near the instrument. As soon as the hypnotic state was induced the following suggestion was given to the patient: "You are dead to everything else in the world except the music which is now to be played, and you will feel and know nothing but this music. Moreover, when awakened, you will remember what effect it has had upon you." A composition would then be played, and the physiologic effects noted; and then the subject was awakened and asked to give his experience, and it is the result of some of these experiments that I now wish to give.

Mr. M. is a physician, forty years old, fond of music and of rather emotional nature. He is easily

hypnotized and passes quickly into the deepest hypnotic state. Wagner's "Ride of the Walküre's was played from the piano-score. The subject" pulse became at once more rapid, fuller, and of increased tension. As the music continued the pulse-rate rose from 60, his normal rate, to 120 per minute, becoming very quick, full, and of low tension; at the same time the rate of respiration was increased from 18 to 30 per minute. The subject's face showed great mental excitement; his whole body was thrown into motion; the legs were drawn up and the arms tossed in the air; at the same time the whole body was bathed in a profuse sweat. On being awakened the subject said that he did not perceive the music as sound but as *feeling*, and that this feeling was a sensation of wild excitement, brought on by "riding furiously through the air." This state of mind brought up before him in the most realistic and vivid manner imaginable the picture of the ride of Tam O'Shanter, which he had seen years before; that almost immediately this became real to him, and in some way he took part in the wild chase, not as a witch, devil, or as Tam, but in some way his consciousness was spread through every part of the scene, being of it, and yet also playing the part of a spectator.

Mr. O. is twenty-two years old, of average musical and emotional development. He is not so easily hypnotized as the first subject and does not pass into such a deep state. Under the influence of the same musical composition, the same effect upon pulse and respiration was produced, the former rising in rate from 70 to 120 beats per minute. The patient's expression remained unchanged, and no movement of the body was made. The skin was covered with profuse perspiration. When aroused the subject said that he had received a perfect sensation of "riding furiously through the air,"

and that this feeling had created for him a perfect picture of a horse-race in the most complete and startling detail.

The effect of this composition upon all was practically the same. All experienced a "feeling of riding," which almost immediately brought up from their past experience some association directly connected with this state of feeling; as, for instance, the physician had at one time been deeply impressed by a large picture of Tam O'Shanter's ride; the student had previously attended horse-races with great interest. Only one of the subjects knew of the connection of the music with the story of the "Walküre;" and to that one it always expressed and pictured the wild ride of the daughters of Wotan, the subject taking part in the ride.

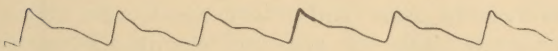
It is here to be noted that the subjects could not tell afterward what music had been played to them while in the hypnotic state; and that the same composition played to them while in the normal state produced no impression comparable with that received in the hypnotic condition, and was without physiologic effect.

Appended are some pulse-tracings, taken from one of the subjects during the playing of the "Ride of the Walküre." Though made with a very poor instrument, they were taken under exactly similar conditions, and in the same period of time, and thus show the relative changes in the pulse-wave under the effects of music.

In all of the subjects, after being hypnotized, there was a slight increase in the rate, with a decrease in size and tension.

As the weight upon the lever was kept in the same place for all of these tracings, the true character of the wave in Nos. 3 and 4 is not shown, as the weight was not properly adjusted to the higher wave.

TRACING 1.

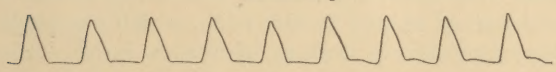


Pulse-tracing in normal condition; 70 beats per minute.

TRACING 2.

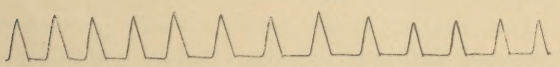
Pulse-tracing from same subject in hypnotic state; 82 per minute.

TRACING 3.



Pulse-tracing from same subject, in hypnotic condition, just after the playing of the selection from Wagner's "Die Walküre" had been begun; rate 95 per minute, high and quick, tension lowered.

TRACING 4.



From same subject, in hypnotic condition, during height of excitement, produced by same composition; 120 beats per minute, high, quick; tension low, marked irregularity in force. Tracing taken from the same person in normal condition, after violent exercise, shows almost exactly the same character.

The fire-music from the closing scene of the "Walküre" also produced increased pulse-rate, with greater fulness and less tension. To one subject it brought up an image of flashing fire; to

another of waters rippling and sparkling in the sunshine; to another, of an ocean in which great breakers threw up glittering spray into the sunshine, the chief idea being in every case that of "sparkling."

The "Walhalla" motive, played in full, at first slowed the pulse and raised the tension; later, almost doubling the rate and lowering the tension. To the subject it gave a feeling of "lofty grandeur and calmness," and this in turn brought back the experience of mountain-climbing made years before, together with the mental state produced by the contemplation of a landscape of "lofty grandeur."

The music of the scene in which Brünhilde appears to summon Sigmund to Walhalla produced a very marked change in the pulse, which was made slow, irregular in rhythm, and very small. The respirations were decreased in rate, and became gasping; the face became pale, and covered with cold perspiration. The feeling described by the subjects was that of "death." No definite impression could or would be described.

The effect of single chords in certain relations produced wonderful effects. If during the height of excitement caused by the "Ride of the Walküre," in the key of B major, the chord of B minor was suddenly and loudly played, a most remarkable change was produced in the subject. In the case of the physician all excitement suddenly ceased, the subject's face became ashy pale, and covered with cold sweat; the pulse-rate dropped from 120 to 40 per minute, and became very irregular, soft, and small; the respirations were decreased in number,

and became sighing in character. The whole picture presented was one of complete collapse, so that all who saw it were alarmed. On being awakened the subject said that he had been oppressed by a horrible fear, because "everything had suddenly seemed to come to an end."

This experiment was repeated many times, with always the same result. Upon the other subjects a similar effect was produced, with the same sensations, but of less intensity. It is to be remembered that none of the others could be put into so complete a state of hypnosis as this one subject. The same chord played in any other relation than the one mentioned produced no effect whatever.

Many experiments similar to these were tried, and from the results obtained it must be conceded that music is capable of producing remarkable physiologic effects in persons in the hypnotic state. These changes are most marked in the circulatory system. The action of the heart may, on the one hand, be doubled, or on the other decreased two-thirds of its rate almost instantly, a change that cannot be produced by drugs or by any form of suggestion. At the same time the other characters of the pulse are correspondingly affected. The rate and character of respiration can also be greatly changed, and the vasomotor system is also apparently under musical influence.

Other curious effects were also met with in the course of the experimentation. Certain chords produced in one subject, whenever they were sounded in certain combinations, most marked and painful contractions in the muscles of the legs, of so

intense a degree as to cause pain for hours afterward. It was found, moreover, that the power of music was stronger than that of word-suggestion. One patient was thrown into a state of hyperesthesia by the playing of the overture to "Tannhaüser." When given a suggestion that a needle run into his arm would cause no pain he shrieked loudly because of intense pain produced by simple contact of the blunt end of the needle with the surface of the body. At all other times the spoken suggestion produced complete anesthesia. Connected with the hyperesthesia was also an exaggeration of the tendon-reflexes.

It was also found that as a means of producing the hypnotic state music is far superior to the ordinary methods. Different compositions seem to vary in power; as, for instance, one subject could be hypnotized only by the "Pilgrims' Chorus" from "Tannhaüser." Usually before the fifth measure was reached he would be in a complete hypnotic condition; and by no other means could this be accomplished so quickly and so perfectly. It mattered not where the subject was, or what he was doing at the time, even if in another part of the house; this piece of music, as soon as he had perceived it, had an irresistible power over him. It became necessary finally to oppose this effect by means of word-suggestion, in order to release him from its influence.

Having been told by a physician who was present at some of the experiments described, of a case in his knowledge in which certain combinations of tones in orchestral performances produced sexual

orgasms, an attempt was made to ascertain what effect could be produced upon the sexual function by music popularly supposed to be suggestive. The passages from "Die Walküre," "Tristan and Isolde," etc., long severely criticised because of supposed character in this respect, were found to produce only feelings of "longing," "frenzy," etc., but never exciting any sexual desire or suggestion. By the aid of word-suggestion, such effect could be produced, and the emotions of "longing," etc., could be made identical with the physical desire; but never did music of its own accord arouse such a state. And in this connection it may be said that music never directly aroused any purely physical state, as hunger, thirst, fatigue, etc., but gave birth primarily to soul-states.

The first effect of the music was always the production of a pure emotional state; and this emotion brought up in the subject's mind, through the power of association, a perfect and realistic reproduction of some past experience most closely connected above all other experiences with this emotional state. This was always purely personal. If the music produced the feeling of "death," as did some of the Wagner passages, the experience brought up was always that one death which had most deeply touched the subject's emotional life. The physiologic changes in circulation, etc., were partly the direct outcome of this emotion, and partly the result of the secondary experience. The difference in the effects of these two factors could almost always be noted. Thus, for example, the "Walhalla" motive: when first played it produced in-

creased fulnesss and tension of the pulse, the subject breathing deeply but quietly. As the association of the mountain-climbing rose above the mental horizon the pulse became quicker, with lower tension, and the respirations became increased in rate and force. All of the experiments produced results that could be explained in this way, with the exception of the production in one individual of muscular cramps and hyperesthesia. These conditions seemed to have no relation to the emotional state or to the secondary state of association. As the subject put it: "The music simply did it, and that was all there was to it."

The account of the total number of experiments made in this line might prove interesting reading, as the results certainly in themselves were interesting; but in each case the effect was practically corroborative of the foregoing. It is certainly neither desirable nor safe to draw important conclusions from results obtained in such a small number of cases, and I make this report only in order to call attention to the results obtained in one set of subjects. As the difficulties attending hypnotic experimentation are many, the work necessary to establish these results more firmly can be done only by those who have unusual opportunities for investigation in this line. To such I leave this field. Moreover, if music has any therapeutic value, it must to a chief extent be the effect of suggestion; so that, if anything is to be hoped for from its power it must be along this line. Further investigation must show this.

In conclusion, I would say that experiments of

this nature may be attended by danger. The symptoms of collapse developed at times, with the accompanying intense emotional shock, might be increased beyond the point of safety. In individuals of strongly musical and emotional natures disastrous results are not inconceivable. There is also danger of establishing an hypnotic habit. In one subject, to whom the intense emotions and vivid experiences were very pleasant, the power of self-hypnosis under the influence of music was practised even in public concerts. The habit was broken by means of word-suggestion. It is necessary, therefore, that hypnotic experiments be conducted with great care, and the possibilities always borne in mind.

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